THE Cane Growers' QUARTERLY BULLETIN

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BUREAU OF SUGAR EXPERIMENT STATIONS

BRISBANE QUEENSLAND

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BUREAU OF SUGAR EXPERIMENT STATIONS
BRISBANE

THE CANE GROWERS' QUARTERLY BULLETIN

ISSUED BY DIRECTION OF THE
SUGAR EXPERIMENT STATIONS
BOARD

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This Bulletin is an official publication of the extension service of the Bureau of Sugar Experiment Stations, issued and forwarded by the Bureau to all cane growers in Queensland.

The Cane Growers' Quarterly Bulletin

VOL. XXIV. 1 April, 1961 No. 4

EDITORIAL

Dr. Kerr goes to Persia

Many canegrowers will be interested in the recent appointment of Dr. H. W. Kerr as supervisor of the sugar project of the Khuzestan Development Service in Iran. The Government of Iran's selection of Dr. Kerr to fill this important post indicates the high esteem with which our industry's technical leaders are regarded in international sugar circles.

The position requires an expert knowledge of both growing and milling and because of his experience in both spheres Dr. Kerr's qualifications in this respect would indeed be difficult to surpass. For the past ten years he has been Director of Research of the Sugar Research Institute at Mackay, an institute which has built up a world-wide reputation for its investigations in sugar milling practices.

Prior to World War II, Dr. Kerr was Director of the Bureau of Sugar Experiment Stations and in this capacity he guided the Bureau through one of its most progressive periods of cane growing research in all its aspects.

Many farmers will remember that his early interest was in soils and fertilizers and, in fact, his soil studies at the University of Wisconsin obtained for him his Doctorate of Philosophy in 1928. The formulae of the widely used Sugar Bureau Fertilizer Mixtures were originated by Dr. Kerr some 30 years ago and the fact that they have required but little change over the years speaks well for the soundness of the principles on which they were based.

Our congratulations go to Dr. Kerr and with them our best wishes for his success in his new venture.

Sugar in 1960*

By NORMAN J. KING, Director of Sugar Experiment Stations

Sugar has been very much in the international news for several months because of the political situation which developed between the United States and Cuba. But that was not an Australian story—nor did it have any direct effect on the local sugar industry.

Here, in our own country, there have been events in the sugar state but they have not made international headlines. By and large we have passed through an average sugar year. The highlights of the season have been a crop with higher than normal sugar content, ideal harvesting weather, an over-peak sugar production at all factories, and an increased acquisition of raw sugar because of shortfalls within the British Commonwealth. In other words, both growers and millers enjoyed a favourable harvest, and the lily was gilded a little by the slightly increased Australian sugar price agreed to by the Commonwealth Government. Although 1960 has been virtually a drought year for Queensland the sugar belt grew sufficient cane for its local and export requirements and the only effect of the drought, even if it had been extended, would have been its impact on next year's production. But sugar cane can absorb a considerable amount of climatic punishment without very much effect, and an average wet season in 1961 will tend to erase any damage caused by the 1960 drought conditions.

One of the events which occurred during 1960, and which forms part of the general progress pattern, was the coming into operation of the fifth bulk sugar terminal—the one at Mourilyan harbour near Innisfail. These bulk terminals at the sugar ports are tremendously impressive to visitors. The latest one at Mourilyan cost two million pounds and can store 150,000 tons of raw sugar in bulk. Imagine a single shed with a floor area of 3½ acres and with ancillary machinery which elevates, weighs and delivers to ships' holds at the rate of 750 tons per hour. In the last five years the sugar industry has spent over ten million pounds in providing this more modern facility for sugar handling at five ports, and today some 85 per cent. of the entire sugar output is transported in that way.

And while we are speaking in a mechanical vein the progress in mechanical harvesting of the sugar cane crop is worthy of mention. Nineteen sixty witnessed a well defined trend in this direction and a degree of interest and enthusiasm never previously exceeded. Development of harvesting machines has been proceeding for decades, but the machine which will cut all crops under all conditions, in a state acceptable by the mill, is not yet a reality. One section of the harvesting routine, that of loading, is well advanced, and upwards of half the total crop is now picked up and loaded mechanically on to transport units. That leaves the actual cutting, topping and bundling of the stalks. There are several successful machines which can do this at a high rate, and with considerable economy, in erect crops; the problem being faced is the mechanical harvesting of crops and there are plenty of them each year—which are recumbent and tangled. But gradually the difficulties are being ironed out.

There has been criticism from ill-informed sources that cane cutting is still in the sickle stage but what is overlooked is that the most progressive sugar growing countries in the world have conducted a large scale attack on this problem for forty or fifty years. And some of the world's largest agricultural machinery manufacturers have spent millions on the matter. It is obviously not an easy nut to crack. An acre of sugar cane contains approximately 30,000 stalks weighing, with tops, up to 60 or 70 tons. A machine has to cut each stalk at ground level, sever the top at the correct point, and discard it, handle the stalks and lay them in bundles in such a position on

*An ABC broadcast made in January, 1961

the ground that they are not an obstacle to the next run of the machine.

On the agricultural research side there has been quiet and steady progress. It was not one of the years when some outstanding achievement attracted outside eyes to sugar research, but valuable advances were made. The world's most baffling cane disease—chlorotic streak—began to disclose some of its secrets as the result of intensive research in Queensland. Cane breeding gained further successes with both more vigorous varieties and higher sugar contents, and one of the striking experiences during 1960 was the small amount of frost damage despite a severe winter. This obviously reflects the change in cane varieties over recent years from shorter or frost susceptible types to taller or more resistant ones. There has been considerable expansion in weed control by aerial spraying, and a deal of experimental work with leaf desiccants which is aimed at improving pre-harvest burning of crops and thus aiding the work of mechanical harvesters.

Up to a few years ago every successive season appeared to chalk up a production record. But now international controls dominate the scene and our export quota is fairly rigidly fixed. However, 1960 is one of the occasional years when an escape clause operates in the British Commonwealth Sugar Agreement and this year our export quota has been increased because of a deficiency of production in another Commonwealth country. This increase, being of the magnitude of 100,000 tons of sugar, had the very desirable effect of providing an outlet for an already existing crop surplus; and it also had the fortunate result of increasing Australia's overseas credits.

During 1960 leaders in the sugar industry were successful in enlisting the aid of C.S.I.R.O. in initiating research into finding other uses for sugar than as a food. At the moment the world is over-supplied with sugar and many countries have to restrict production so that unsaleable stocks do not accumulate. Australia is one of those countries. The Sugar Research Foundation in New York has existed for several years for the same purpose and its target, and that of C.S.I.R.O., will be to find some industrial application in which sugar or sugar derivatives may be economically utilised. The industrial chemistry division of C.S.I.R.O. is in the best position to survey such a problem, and has both the staff and the facilities to further the necessary research.

The world oversupply of sugar is not just the result of bounteous seasons everywhere; it is the result of production outpacing consumption. Some countries are increasing the acreage being farmed to sugar so as to achieve self sufficiency in their own territories or to earn export credits; while others, the established producers and exporters are increasing their production efficiency faster than their markets. Queensland falls within the latter class and, even with strictly controlled areas, the output of sugar from each acre tends to increase. If the growth in efficiency continues the stage will be reached when farmed areas will have to be reduced. It is to avoid this that other uses for sugar are being sought.

Such an investigation cannot but be a long term one. A new industrial use for many thousands of tons of sugar is not likely to be found easily—and we are cognisant of the fact that similar research has been proceeding for years in other countries. But we are living in a time of extraordinary scientific achievement—a period which may well become known historically as the chemical age. So there is room for optimism so long as it is tempered with patience.

The search for other outlets for sugar is aimed at developing the sugar industry to a size beyond that required for the supply of existing markets. But, of course, the industry will continue to expand even if no other uses for sugar are discovered. Australia's population growth will create a progressively increasing demand and there must be some long range optimism in regard to a growing export market. The world's

accelerating population growth, and the expectation of what is described as a population explosion during the next generation, will increase the consumption of sugar enormously. Since some of the existing producers will be unable to step-up their production appreciably because of lack of area, the opportunity may be open to those countries with available land to compete for greater quotas.

And what of the immediate or foreseeable future? No spectacular advances are anticipated either in field or factory. The market limitations have had the effect of stabilizing production and there will be a period of consolidation during which the known results of technical research can be translated into practice. There will be steady progress in many phases of the industry, and research will not languish because of over-production. On the contrary, the increasing cost spiral is a challenge to the sugar producer to maintain a low level of cost of production by increasing field and factory efficiency. The best chance of achieving this desirable state is by such measures as higher yielding and sweeter cane varieties, better control of pests and diseases of the crop, reduction in harvesting and transport costs, better factory extraction and recovery, and a better understanding of plant nutrition. Once any progress is made by the research organizations there is no delay in translating it into industry practice by means of excellent extension services.

Sugar production in Australia has doubled during the last twenty-five years.

Even though this growth rate may not be maintained in the next twenty-five the development and progress will be nonetheless demanding of knowledge, and dependent on the results of research.

Army-worm and Grasshopper Outbreaks

During the last few months, cane-growers in many parts of Queensland from Mossman to Bundaberg, have been troubled by outbreaks of army worms, which to a greater or lesser degree defoliated young cane crops in certain sections of their farms. In many instances these outbreaks originated in patches of grass, weedy fields of legumes, and also in fields of cane which became grassy following the sudden change to stormy conditions at the end of 1960. This rapid upsurge in army-worm populations could no doubt be attributed to the temporary scarcity of parasites and predators which had been decimated by the previous long spell of dry weather.

Where their activities were recognised while the caterpillars were still immature, they were prevented from invading new areas or they were controlled in the infested crops by spraying with DDT at the rate of $\frac{3}{4}$ - 1lb. per acre. In some earlier defoliation experiments, losses of this nature were estimated at about two tons of cane per acre, and furthermore there were attendant disabilities incurred such as additional cultivation and harvesting costs. So the outlay of up to £2 per acre for spraying to prevent army-worm damage was more than offset by the losses that would otherwise have been sustained. Unfortunately some spraying was delayed until most of the caterpillars had pupated, so this late attention resulted in some waste of effort and money.

The same dry conditions were responsible for the appearance of large numbers of the spur throated grasshopper in cane districts from Mossman to Mackay in December, 1960. There fliers laid eggs and the resulting young hoppers banded together in swarms to defoliate young cane on many farms. Spraying with appropriate insecticides was in progress when this Bulletin was going to press. —R.W.M.

Dalapon Plus 2,4-D for the Control of Weeds in Irrigation Channels

By L. S. CHAPMAN

Any discussion on the use of chemicals for the control of weeds in irrigation channels or, for that matter, any other weed problem must have cost as a primary consideration. Initially when chemicals are being considered the price of the existing method of weeding must be calculated.

Fig. 57—Grass is usually the dominant weed in irrigation channels as shown by the unsprayed portion on the right. The area on the left was sprayed with dalapon alone which controlled the grass only and allowed the broadleaf weeds to grow unchecked. Hence the necessity to add 2,4-D to the mixture so that both types of weed are killed.
Photo—L. S. Chapman

Until recently, practically the only means of keeping irrigation channels free of weeds was to hand hoe them. The price, then, of controlling these weeds must be thought of in terms of personal effort or as wages paid to an employee. Reducing this to monetary terms it is estimated that the cost of hand hoeing a channel 80 chains long by 8 feet wide, which is about one acre of channel, would be approximately £30. That is it would take an employee, earning £15 per week, two weeks to complete this task. The density of the weeds, the intensity of the sun's rays and many other factors would of course vary this figure.

It should be emphasised that the above figure is the cost of removing only *one* crop of weeds from an irrigation channel of 80 chains by 8 feet. This is very close to the size of channel which is to be found on irrigated farms in the Lower Burdekin area. As every experienced farmer realizes, such a hoeing operation would have to be performed up to three times or more in a season.

It is not practicable to weed these irrigation channels by mechanical means. If the operation could be done readily with a machine attached to a tractor then there would be little point in further discussing the problem. District experience with chemical weed control has repeatedly proved that, at present costs, chemicals can compete successfully if a weeding job has to be

done by hand. Mechanical weed control is often more attractive financially than the use of chemicals, but since a mechanical method is not available then chemicals must be considered. Fortunately, for an expenditure of half the price of hand hoeing, that is for £15 per acre, there are numerous chemicals and combinations of chemicals which are capable of doing an excellent job of removing an existing crop of weeds from a channel.

Of the chemicals which are commonly used by farmers for weed control, power kerosene, distillate, crude oil, TCA, and PCP are quite effective for the control of weeds in irrigation channels. Combinations of PCP + TCA, PCP + distillate or crude oil, dalapon + 2,4-D, or even dalapon + TCA + 2,4-D give good initial control if £15 worth of these chemicals or combinations are applied to 1 acre of channel. Experience with many of these has shown that chemical weed control in channels is definitely a sound economic proposition. It is likely that anyone who is faced with chipping an acre of drains during hot February weather would willingly pay £30 or more if the drains could be weeded chemically rather than resort to hand hoeing.

Best Combination

However, although all of the chemicals or combinations of chemicals which have been mentioned are effective to some degree in controlling weeds, the combination which gives the most lasting control is dalapon + 2,4-D. This mixture contains dalapon which specifically controls grasses and not broadleafed plants, while 2,4-D controls broadleafed plants and not grasses.

Timing of Application

As with many other operations performed on a farm, timing of the application is important, more so in this case than is generally realized by farmers. To get optimum results it is necessary to spray the drain when the weeds are making luxuriant growth, and before they actually seed. This means that they must be sprayed either after the first or second watering following the final hilling up when the weeds would be from six inches to nine inches high.

Mixing Spray Solution

When preparing the spray solution, 5 lb. of dalapon + 2 lb. of 2,4-D + approximately half cup of a wetting agent are mixed with water to make up a 44 gallon drum full. Two drums full of this solution would be sufficient to spray one acre of drain (or about 80 chains by 8 feet) which is the average area of drains per farm. It is desirable to include the wetting agent with the spray to ensure that optimum coverage of the foliage will occur.

Application

A practical way of achieving this dosage rate is to thoroughly wet all the vegetation in the drain. This means that if patches of drain have denser growth then it is recommended that more spray be applied to this section of the channel and if the growth is lighter then less spray will be required. It has been found that if the channel averages from six inches to nine inches of weed growth then the above amount of spray will be adequate to completely wet all the vegetation. Naturally if all the drain has more or less than six inches to nine inches of growth then more or less spray will be required than that stated. Good results cannot be expected if too little spray is applied, and the best guide is to ensure that all vegetation is thoroughly wetted. It is recommended that a spraying pressure of 40 p.s.i. or higher be used.

Advantages

The many advantages that this combination of chemicals has over the other combinations are numerous. As already mentioned, it has a more durable control than the other combinations. A cross channel which has been sprayed at the correct time should only require one spraying, but an outside channel may require two applications per season. Excellent control in all drains on the Lower Burdekin Experiment

Station was obtained in 1960 by one application of this mixture. On river farms and where nut grass is present two applications may be necessary. Three applications may be required on permanent channels per season.

The presence of 2,4-D is desirable in a spray used in any drains which have nut grass present and without 2,4-D in the combination nut grass is not effectively controlled.

Equipment is not seriously corroded by this spray. No special spray equipment is required to apply it, as both chemicals are soluble in water.

A noticeable feature of this mixture is that it takes a considerable time to kill the vegetation. This slow action has been interpreted as a failure initially by some farmers but they have been surprised four weeks later, or sometimes longer, to find that the apparent failure had turned into a 100 per cent. kill. This possibly is one reason why the effect of the mixture is so durable. The dying vegetation maintains a mulch over the ground thereby limiting the germination of other weed seeds available to replace the first crop.

Weeds Controlled

Although the weeds predominantly present in channels in the Lower Burdekin are grasses, after using this combination of chemicals it has been noticed in permanent irrigation channels that at the second spraying there was a dominance of weeds which are known to be slightly resistant to 2,4-D. Should this happen, and it is most likely to occur in permanent channels of which there are a continually decreasing number, then it is recommended that 2,4,5-T be substituted for the 2,4-D in the combination. This should be used at the rate of five fluid ounces (80 per cent. w/v of emulsifiable 2,4,5-T ester) per 44 gallon drum of spray.

Two Promising New Chemicals

There are a number of new chemicals which are currently becoming available commercially which have outstanding properties for the control of weeds in irrigation channels. Two of these, monuron and diuron, have been used successfully in experimental work on irrigation channels. These chemicals have demonstrated that they give excellent control of all weeds, including nut grass, in channels for a complete season if they are applied in sufficient quantity on bare consolidated soil. However, these chemicals are only slightly soluble and when mixed with water they form suspensions which have to be agitated while being applied.

The lindane spray machine currently gaining popularity in the Lower Burdekin would handle these products satisfactorily. Unfortunately both of these chemicals have one great disadvantage, and that is they are too expensive. It is considered that at least 20 lb. per acre of either of these chemicals will be required to give adequate control and the current price of £2/10/- per pound would mean that at least £50 per acre would be the cost of controlling the weeds in one acre of ground. At present they cannot compete on a cost basis with dalapon + 2,4-D for the control of weeds in irrigation channels. However reduction of the price of monuron and diuron would make them highly attractive.

Care Required in Handling Chemicals

A final word of advice to growers is that all chemical sprays should be handled with a reasonable amount of caution. Although the dalapon-2,4-D combination is of lower known toxicity than several other weed-killing chemicals careful usage is still advisable.

Inhaling the fine spray should be avoided and it may be found that some skins are sensitive to contact.

Sprays containing PCP (pentachlorphenol), in addition to being extremely irritating, can be extremely poisonous if due eare is not exercised. This chemical is known to have caused several deaths in Queensland.

The Burnett Turntable

By N. McD. SMITH

The greater areas of standover cane for harvest in recent years have led to a big increase in the number of front end loaders operating in the Bundaberg district.

The attractiveness to the individual grower lies in the comparatively low capital cost of such equipment in relation to its value in overcoming the problem of maintaining allotments to the mill. Without a mechanical means of loading, recumbent crops reduce a hand cutter's output very considerably and, further, would attract higher loading rates. On the other hand, there are disadvantages with the use of front end loaders relating to damage to cane rows adjacent to tramline and harm to tractor tyres which can occur from constant crossings of the line. With this type of loader it is necessary to dump from one end of the tram truck and the frequent trips to do this can result in the damage as mentioned. The effects on ratooning are more pronounced if the soil is soft following rains, as tractor wheel slip often tears the cane stubble.

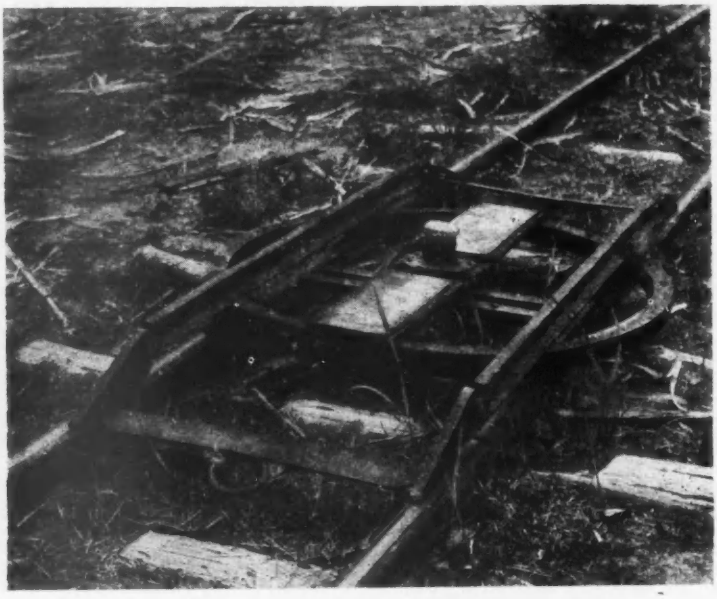

Fig. 58—The Burnett Turntable for use on portable tramline. In the illustration the turntable is shown mounted on permanent line merely for convenience in taking the photo.
Photo—N. McD. Smith

It occurred to Mr. M. Baker, Clayton, Bundaberg district, that a portable turntable which could be placed at any position along the tramline would minimise these drawbacks and also facilitate loading.

The accompanying illustrations show the prototype constructed by the Burnett Engineering Works, the basic section being an old waggon turntable with angle iron pieces welded to the

Fig. 59—Another view of the Burnett Turntable.
Photo—N. McD. Smith

bottom ring. These pieces position and hold the turntable by fitting between the rails of the tramline.

To the uppermost ring two short sections of light tramline have been fixed and are of sufficient length to take a tram truck.

At each end of the short pieces of tramline are hinged points which are raised when the empty truck is ready for loading. Rings which are welded midway along the crosswise strengthening bar of the points are engaged in the hook at either end of the tram truck and anchor the truck during operations.

The turntable was used successfully during the 1960 season and the loss of time in twisting the truck was compensated for by speedier loading.

Correct Fertilizer Mixtures

In view of the number of enquiries received during the past year regarding fertilizer mixtures recommended by the Bureau, the following note appears warranted. Some growers have followed our recommendations for ratoon crops but have been uncertain as to which mixture is required for the succeeding plant crop. Sugar Bureau mixtures are available as either planting or ratooning mixtures and whichever number mixture is recommended for ratoons, then the corresponding planting mixture is required for the next plant crop. For example, if Sugar Bureau Mixture No. 2 is recommended, then the Sugar Bureau Ratooning Mixture No. 2 should be applied to the ratoon crops while Sugar Bureau Planting Mixture No. 2 is to be used when replanting the block.

—G.C.B.

More Mechanical Cane Topping Devices

By E. A. PEMBROKE

A Tractor Powered Topper

The advent of a new implement is generally followed by modifications and improvements to the implement although the basic principle remains unchanged. The original cane topping machine described in the Quarterly Bulletin, April, 1958, is no exception.

Fig. 60—Mechanical cane topper powered by tractor.

Photo—D. A. Beak

Since this machine was designed the following variations have been made (Fig. 60).

(1) Modified car differentials are often used for the transmission of power from tractor to saw.

(2) In order to dispense with a special frame, units are now designed for attachment to the grubber frame.

(3) The wooden foot which raises the cane tops to the saw has been replaced by a metal one.

This machine still sells at about £130. Generally it is owned by the grower and operated by the cutter. A price adjustment to the cane cutting rate is necessary to make the machine an economic proposition for the grower.

Manually Operated Topper

A different adaptation of the same principle is the manually operated topping device (Fig. 61). This machine was constructed largely of scrap materials. The chassis consists of two lengths of angle iron to which are bolted wheel and saw supports. A suitably shaped steel fence post makes the foot, whilst the handles are from an old scarifier. The wheel is from a 28 inch bicycle and the tyre is kept inflated.

A Villiers 12 two-stroke motor comprises the power source; this is refitted to the motor mower when required for lawn cutting. By this means the cost

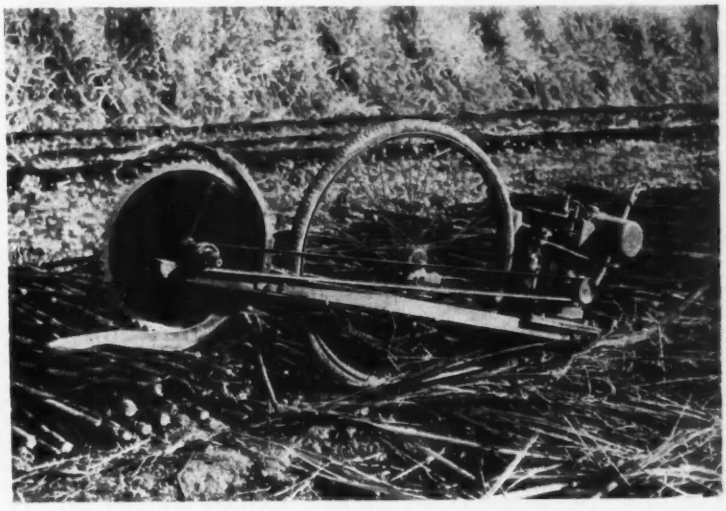

Fig. 61—Manually operated cane topper.

Photo—D. A. Beak

Fig. 62—Disc coulter topper on front wheel of tractor.

Photo—D. A. Beak

of construction of the topper is greatly reduced. Power transfer is through two three inch pulleys and a V-belt.

Cane can be efficiently topped by this machine but operators are of the opinion that a Villiers 15 motor would supply a better reserve of power. Construction of the machine at a cost approximating £60 (including motor) brings it well within the possibility of private ownership by the cutter.

Coulter Type Topper

A large disc coulter attached to the front wheel of the tractor (Fig. 62) has also been employed for the purpose of topping cane. The quarter inch thick, reinforced coulter is some four inches greater in radius than the wheel of the tractor. Its cutting edge is sharpened and hardened. The centre of the disc is drilled out to take the wheel hub. Three of the standard wheel bolts are replaced by longer ones to enable the device to be bolted to the wheel. Attachment to the tractor is simple and is quickly done. The implement works best on a clay soil type. Its use renders the steering of the tractor somewhat difficult. Cost of the device is approximately £18.

The loading tractor is generally employed to power the mechanical cane topper or the topping disc coulter. All three machines top cane as efficiently as the cutter and in a few minutes operation will top all the cane cut for the day. These machines are particularly useful in a heavily arrowed crop where hand topping is rendered difficult by the toughness of the arrowed stalks.

Sub-Stations for Seedling Selection

The major sub-station at Mourilyan in the far north was maintained on a full scale. There, 1,618 selections were planted in 2-sett plots, 184 in 4-sett plots, 114 in 30-sett plots and ten in 180-sett plots. This sub-station is well developed and many varieties from it are now going into farm propagation observation trials. Since this station also, to a large extent, will serve the Babinda area, the sub-station at Bartle Frere is being allowed to lapse and the planting there was reduced to 45 varieties in 30-sett plots and 41 varieties in a yield observation trial. It is not proposed to make any further planting on this sub-station in 1960.

Variety testing was expanded also in the north by developing sub-stations at Tully and Ingham. At the former place, 43 varieties from the Innisfail sub-station were planted in 40-sett plots whilst at Ingham, 73 varieties were introduced to the Abergowrie area from the Northern Experiment Station, 33 from Ayr, 27 from Mackay and eight from Bundaberg.

In the south the introduction plot was maintained at Beerwah and plans were implemented to increase variety introductions to the Isis district. At Beerwah, thirty-two 57-series seedlings, twelve 56-series, eight 55-series and forty-six overseas varieties were introduced from the Southern Experiment Station. From the same source, twenty-seven 57-series, seven 56-series, one 53-series, four "N" series and 22 overseas varieties were introduced to the Isis district whilst the Gin Gin district also received especial attention with regard to introductions on account of the drought problem which exists there.

Although it is not possible to establish full sub-stations in all districts, nevertheless far more varieties than ever before are now being introduced into all mill areas and the result of this expanded programme should soon be apparent as varieties more adapted to specific environments are developed. *(From the Bureau's Annual Report).*

J.H.B.

Varietal Response to Nemagon Fumigation

By R. B. Moller

Very little is known of the reaction of sugar cane varieties to varying nematode populations. However, observations in the field suggest that some varieties are less sensitive than others in the presence of large numbers of root knot nematodes.

The relationship between nematode numbers as determined by soil examination, and cane growth appears to be rather obscure. The species of nematode, together with soil moisture level and fertility, all probably play a part. Some of the highest counts made from Bundaberg have been from rich, heavy, alluvial soil where exceptionally heavy crops are produced. On the other hand, equally high numbers in poor sandy, near-wallum country are associated with very poor cane growth, even when more than adequate fertilizer has been applied.

During the autumn a trial designed to test varietal resistance to nematodes was established on light, red, sandy soil. Thirteen varieties were included. Prior to planting, half of each plot was treated with nemagon at 2½ gallons per acre. Some four months after treatment a composite sample from the treated area yielded 180 parasitic nematodes per 500 gms. of soil. At the same time 1,140 parasites were obtained from 500 grams of untreated soil. Other species as well as the parasitic types were present in addition. Six months after the initial treatment, the inside two rows of each treated plot were

Fig. 63—A marked response to nemagon is to be seen in this Q.63 plant cane. Treated cane on right, untreated on left.

Photo—H. G. Knust.

retreated with nemagon at 2½ gallons per acre.

The young cane has made good progress. Q.68 and Pindar are the only varieties which have, to date, shown no response to the nemagon treatment. On the other hand, there is a very marked depression of growth in untreated plots of Q.63 and Q.58 and to a lesser degree in C.P.29-116, Q.47 and Q.61. With Q.70, Co.290, Q.71, Q.50, N.Co.310 and Vesta there has been an obvious improvement following fumigation, but not of the same order as for the abovementioned varieties. The differences appear to be mainly a matter of superior stooling, greater vigour and healthier appearance following fumigation. There seems little doubt that, if the present trend is maintained, the fumigated plots will greatly outyield the untreated ones at harvest.

South African Visitors

An exchange of ideas and experiences can be most useful to both parties. In October, 1960, the Director of the South African Sugar Experiment Station (Mr. J. Wilson) and the Senior Plant Breeder of that Station (Dr. P. G. Brett) visited Queensland sugar districts. The visitors spent three weeks with the Bureau at its various centres.

Queensland, the southern districts in particular, is indebted to the South African Experiment Station for its production of the variety N.Co.310, which is now a major cane in so many of our areas. Bureau staff found it particularly helpful to discuss South African methods with Mr. Wilson and Dr. Brett, not the least feature of these discussions was the behaviour of the several new South African varieties which are under trial here.

Fig. 64—Inspecting a variety trial in North Queensland. From left: Mr. J. Wilson, Director South African Sugar Experiment Station; Mr. R. W. Mungomery, Bureau; Mr. C. A. Rehbein, Bureau; Dr. P. G. Brett, Senior Plant Breeder, South Africa.
Photo—J. H. Buzacott

In the picture above, Mr. Wilson (extreme left) and Dr. Brett (extreme right) inspect a variety trial in the Mulgrave area. Mr. Mungomery (left) and Mr. Rehbein of the Bureau staff explain the plot details.—L.G.V.

Fig. 65—Mossman, the northernmost sugar district, has a reputation for its modern approach to district advancement. An experiment, in co-operation with the Bureau, to test the value of spraying for better burns. Note the movement of the cane in the down-draught.

Photo—B. T. Egan

Fig. 66—The search for improvement in soil fertility still goes on. A trial on Mackay Sugar Experiment Station, bagasse on left and filter mud on right.

Photo—C. G. Story

Fig. 67—A sheltered corner for the new seedling canes at Mackay Sugar Experiment Station.
Photo—C. G. Story

Fig. 68—A familiar scene in the Burdekin district. Young ratoons being watered. Mr. Berryman's farm, Home Hill.
Photo—C. G. Hughes

Fig. 69—The fire and its master—A pre-harvest burn at Ingham.
Photo—R. W. Mungomery

Fig. 70—A "hot burn" at Bundaberg.
Photo—N. McD. Smith

Fig. 71—**The Sugar Window. Part of a display at the Queensland Agent-General's Offices, Strand, London, November, 1960. The cane stalks were air freighted from North Queensland. The tops are artificial.**

Photo—Queensland Agent-General

Fig. 72—**The junction of the North Johnstone (left) and the South Johnstone rivers at Innisfail. A colourful scene adjacent to the centre of the town.**

Photo—G. Bates

Incorrect Fertilizer Placement Can be Harmful

By P. G. ARNOLD

The importance of correct placement of fertilizer in the drill at planting cannot be over-emphasized. A check on the position of the fertilizer delivery chute should always be made to ensure that fertilizer does not fall on to the cane sett, for if this does occur the sett may suffer severe root stubbing and "burning" of eyes.

The degree of injury to the roots varies according to the amount of available soil moisture and the soil type—sandy soils being more conducive to damage because of their poor moisture retention. Growers who follow the practice of including large amounts of sulphate of ammonia in the planting mixture run an increased risk of incurring loss as this fertilizer is notorious for damaging and causing the death of the eye.

An example of what may result from this incorrect placement of fertilizer can be seen in the accompanying photograph.

The grower commenced planting the block in stages, as harvesting conditions would not permit him to complete the block in one operation. The early planted section germinated very slowly and erratically. An investigation revealed root stubbing and burnt eyes where fertilizer had fallen on to the setts. Before planting was resumed the delivery chute was moved three inches to one side so that fertilizer would not come into contact with the sett, and no further trouble was experienced.

As may be seen in the photograph, cane growth in the "burnt" area has been severely retarded. As well as poor vigour, poor germination and lack of stool were very noticeable, and contributed to the estimated loss of 15 tons per acre.

Fig. 73—The cane on the left of the photograph is showing the effect of damage by fertilizer "burn" at planting. An adjustment of the fertilizer chute of the planter resulted in an increased yield of 15 tons per acre, as shown by the cane on the right.

Photo—P. G. Arnold

Legume Seed for the Sugar Industry

By G. A. CHRISTIE

Leguminous cover crops grown in the sugar producing lands of the State have undergone slow changes over the years. Twenty years or more ago, Mauritius bean (one of the velvet bean varieties) was used extensively when a cover crop of long duration was required, but one of the main difficulties associated with this legume was the fact that while the overall germination of seed was generally quite satisfactory, many of the planted seeds remained dormant in the soil for long periods, often producing a vining crop after cane had been planted. Those who have been associated with the sugar industry for many years will recall the difficulties of harvesting "green" cane, for pre-harvest burning was practically unknown, where stools were bound together by the strong runners of Mauritius bean.

Modern varieties of velvet bean germinate more readily and the difficulty of controlling vines in cane only occurs when the cover crop has been allowed to produce seed prior to its incorporation in the soil. In such cases control can be obtained by the use of a suitable weedicide.

Fig. 74—Malabar cowpea planted in rows for seed production.

Photo—G. A. Christie

Cowpea Varieties

Cowpea varieties have provided a

very satisfactory legume for short period cover cropping in most parts of the State's sugar belt. The variety Poona pea is one of the best known, but in many areas this variety has been replaced with Reeves Selection, which shows a higher resistance to stem rots and wilt diseases which periodically cause crop failures in the wetter areas. Another cowpea which has given very satisfactory crops is Cristaudo pea, and the area planted to this legume would probably increase if larger seed supplies were available. More recent cowpeas which have been tested for their suitability in sugar areas include Malabar, Santiago and Blackeye 5. Trial plantings have shown that Malabar has given excellent results in many areas. It provides a suitable substitute for velvet bean where this bean has been attacked by a fungous wilt in the northern parts of the State.

Many cane growers are also aware of the fact that the Bureau of Sugar Experiment Stations, in its efforts to serve the cane growers of the State, has carried out cross pollination of legumes with the object of producing new varieties which may be superior to those at present in use. Such work takes many years to produce results, for even after crosses have been made, strains have to be "fixed" so that varieties will grow true to type. Results from the early work in this field may be available in the near future.

Fig. 75—Cutting and windrowing a Malabar pea crop prior to threshing.
Photo—G. A. Christie

Features Required in a Cover Crop

Some of the features required in a good legume include:—

1. Good, uniform and rapid germination.
2. Rapid early growth to prevent the development of weeds and grass.
3. Large bulk of leafy green material.
4. Absence of woody stems to hasten rotting.

5. Ability to withstand adverse climatic conditions such as drought or flooding.
6. Development of nitrogen fixing bacteria in nodules on the plant's roots.
7. Resistance to bean fly, nematodes, stem rots and wilts.
8. Crop duration to fit in with the fallow period of the district.
9. Good seed setting for production of future seed supplies.

room for a major expansion in local seed production for, in addition to Australian sugar producers, graziers also appreciate the value of this protein rich plant as a stockfood.

During 1960 several farmers in the Burdekin Valley planted areas of Malabar to determine whether the production of seed could develop into a sound economic proposition which might eventually provide the seed requirements of the sugar industry.

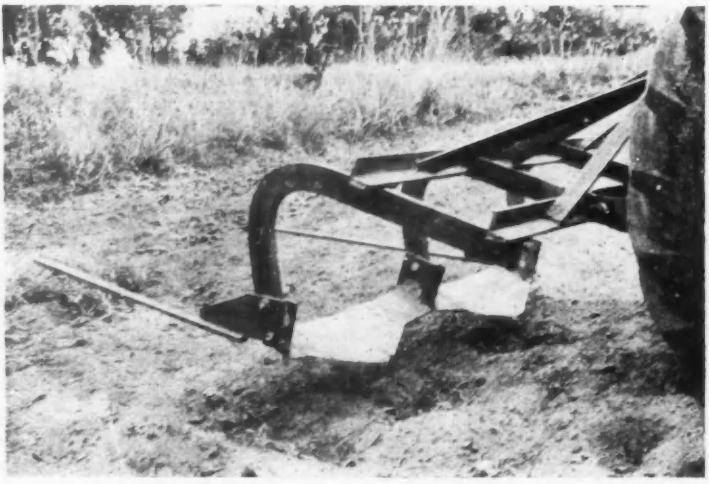

Fig. 76—A home-made cutter used for cutting the bean stems under ground level prior to threshing.

Photo—G. A. Christie

10. Seeds borne high on the plants to facilitate harvesting; soft pods for easy thrashing.

Seed Supplies

The amount of legume seed sold annually in sugar producing areas reaches the substantial figure of between 500 and 600 tons or somewhere in the vicinity of 20,000 bushels. A large proportion of this total of recent years has been velvet bean, most of which has been imported, since the Australian producers have not been able to compete with overseas countries in price. However, since suitable legumes of the cowpea type are now available, there is

The comparatively dry climate should be suitable for ripening and harvesting of the crop while growth can be maintained by irrigation. Yields of seed varied on different properties from five to over 20 bushels per acre, and since there is such a heavy demand for seed it would appear to be a good economic venture, capable of considerable expansion.

Such seed production, developed in close association with representatives of the sugar industry could ensure the availability of the particular legume varieties required by the industry. It could also multiply rapidly the seed of any newly developed legume types.

Smaller Plots for Variety Trials

By J. C. Skinner

The main objective of the sugar cane breeder is to produce varieties which enable farmers to make as much money as possible. A new variety cannot succeed commercially unless it is suitable agriculturally and is resistant to certain diseases, but a high yield of sugar per acre is usually the main character required. This depends partly on c.c.s. and partly on yield of cane. Although c.c.s. is strongly emphasized, yield of cane is even more important.

Unfortunately, yield of cane is a very variable character, and special trials are necessary to select effectively for it. Improvements in yield which are too small to be detected by eye are very important commercially, so it is necessary to weigh the cane accurately. Whereas the c.c.s. of a variety can be measured from the juice crushed from a few stalks, it is necessary to weigh large amounts of cane to measure its yielding ability with the same accuracy.

The yield obtained from a variety depends partly on its inherent yielding capacity and partly on the soil and weather conditions where it is grown. In an apparently uniform field, soil variations cause important changes in yield, even over distances of a few feet. It is usual to test the performance of a number of new varieties in comparison with a standard commercial variety. If only one plot of each variety is planted, and one yields a few tons more than the standard, it is impossible to decide

Fig. 77—In a variety trial the separate bundles are weighed, using a clock-face scale attached to a small grab holding up to 200 lb. of cane. The bundle is raised by means of a lever attached to a bipod.

whether the new variety has a higher yielding capacity or whether it was growing in better soil. To overcome this difficulty the statistical technique of replication is used.

The field is divided into a number of plots of the same size, and each variety is planted in four or five plots in different parts of the field. By measuring the amount each variety varies in different parts of the field, it is then possible to decide whether the higher yield of a new variety is due to its own inherent qualities or to chance. By using replicated trials of this kind the yielding abilities of new varieties are measured precisely on a particular field. However, the trials are for the purpose of selecting varieties for a range of farmlands and a precise comparison on one farm is of limited value because of variation from field to field and from year to year. Promising new varieties should therefore be tested in replicated trials in many different localities. Because of costs and the labour involved, the number of trials which can be planted and harvested is always far short of the ideal.

The plot size has an important effect on costs. In the past, plots of 1/20th acre have been used by the Bureau for replicated trials. By farming standards these are very small plots but, if five plots were planted to each variety, only five varieties (four new ones and a standard) could be tested in 1¼ acres, and it was necessary to weigh by hand 40 tons of cane to make these comparisons.

During the last five years a series of experiments has been carried out to see if smaller plots can be used efficiently for replicated trials. The efficiency of the smaller plots would depend on their accuracy, because small plots vary more than large ones, and on whether or not the results would be biased because of competition between varieties. It is well known that different varieties growing together compete with one another for food, moisture and light. When small plots are used for trials, the yield of strong competitors might be inflated by border effects and that of weak competitors reduced. The ability to compete with other varieties is not necessarily of any value to a commercial variety, which is grown in pure stands. For example, a variety with high yielding capacity might suffer from competition in small plots because of slow early growth.

The experiments have shown that plots three rows wide and about 1/100th acre in area are satisfactory for replicated trials. Each row of each plot was weighed separately and competition was measured by comparing the yield of the outside and middle rows. Measurements on several hundred plots of many different varieties have shown that some competition does occur between varieties grown in three-row plots, but their yields are not disturbed seriously, and the plots give accurate results.

Although competition was not serious in three-row plots, it was found to be very important in small single-row plots. The yield of varieties in these plots was determined much more by ability to compete with other varieties than by true yielding ability. In general, varieties with high yielding abilities tended to gain from competition, but there were many exceptions, and replicated single-row plots were found to be inefficient because of excessive competition.

As a result of these experiments, replicated trials with 1/100th acre plots have now become standard practice on all Experiment Stations and 1/100th acre plots have also replaced the previous 1/20th acre plots for replicated trials on farms. This has made it possible to test many more varieties in replicated trials in different areas, ensuring more efficient selection of high yielding varieties.

Problems in Pineapple Disease Control

By B. T. EGAN

Pineapple disease is quite widespread in our sugar growing areas, and can result in poor germinations, or even total failures, under conditions suitable to the disease. It is caused by a fungus which can live in the soil for long periods, waiting for an opportunity to attack the cane setts. This fungus enters through the sett ends causing a salmon-coloured tissue rot followed by a central blackened pipe which may extend right through the sett or be confined to the end internodes (see Fig. 78). Anything which tends to make the cane slow in germinating favours the disease, and these factors include cold or wet soils—particularly if preparation is hurried and rough—and poor quality plants.

Sometimes the farmer may have little choice and has to gamble on planting under adverse conditions. Before the advent of mercurial dips or sprays some 15 years ago this gamble was almost certain to fail in some areas. Some growers in the Burdekin area can recall having to plant and replant up to four times before they obtained a reasonable strike. Mercurial treatment has now become an accepted part of farm practice where pineapple disease occurs, and in the vast majority of cases the disease is satisfactorily controlled.

However, this very acceptance of the method has led to a certain laxity in its use so that occasionally complaints are received that the mercurial had failed to do its job. In the majority of cases, spray cutter planters were used. Unless these machines are regularly maintained so that the pump delivers solution at the correct pressure to nozzles in good condition and fully protected from obstructions, then a complete coverage of the sett by the solution will not be achieved.

Another fault is incorrect mixing of the mercurial solution itself. The recommended strength allows a fair margin for error when the solution is fresh, but the active ingredient can be destroyed if too much organic matter and soil gets into it. Hence the weakee the solution used, the greater the chancr of failure. It is essential that topping-up be carried out frequently in both dip and return-spray cutter planters, and that the solution tank be emptied at the end of the day's work. A few extra shillings spent on mercurials can save many pounds and much effort in supplying a poor strike. Such a case is seen in Fig. 78, which shows a poor strike resulting from guess-work when making up the mercurial solution.

Fig. 78—Poor strike caused by Pineapple disease. The split setts show typical symptoms.
Photo—B. T. Egan

It is also important that there should be no cracks in the sett ends. These provide an ideal point of entry for pineapple disease since they often open up

after planting. A sharp cutting blade will do much to prevent this cracking. In Fig. 79 the cracks can be plainly seen in the sett ends as the black spores of the fungus have formed there first.

The widespread destruction of surplus cane in the past few years could lead to an increased pineapple disease problem in some areas. This effect has been noted on a few previous occasions, where the fungus was able to build up to dangerous levels by living on the cane that was disced, ploughed or rotaried into the soil. Farmers planting such blocks should be doubly careful if they know there is pineapple disease on the farm.

Where stick-in-the-drill method of planting is used, little can be done to prevent pineapple disease infection. Some farmers have used knapsack sprays to apply mercurials after cutting up but this is time consuming and not very effective. The practice of throwing the mercurial solution over the whole stalks before they are planted may speed up germination but it is ineffective against pineapple disease. The only solution to this problem once the disease is widespread on the farm is to change the method of planting so that a mercurial can be used to protect the cut ends.

Briefly, the essential points in controlling pineapple disease are:—

1. Make sure the planter, whether spray or dip, is functioning properly all the time.
2. Use any one of the brands of organic mercurials on the Queensland market, and at the recommended concentration.

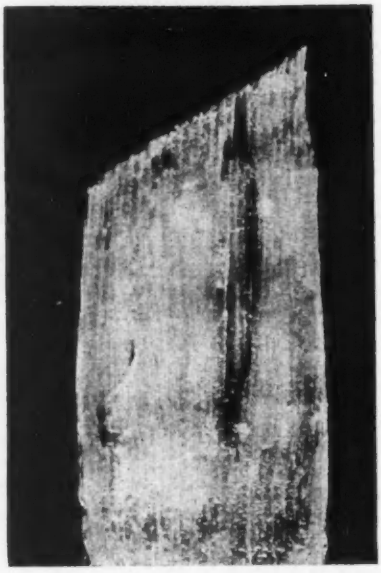

Fig. 79—Black spores of Pineapple disease formed along cracks in sett ends caused by a blunt knife.

Photo—B. T. Egan

3. Top-up or replenish the solution regularly, and discard it once it becomes too dirty, or at the end of the day.

Rind Disease

An outbreak of rind disease in a heavy crop of March plant Vesta at South Kalkie led to the death of 3-4 per cent. of all stalks. More than 10 per cent of the remainder showed apparently dead lengths of stalk but the tops still survived. C.c.s. figures were in the range 11.55 to 14.52 varying with the elevation in the block but the disease had, surprisingly, apparently not affected the sugar.—C.G.H.

The Growers Part in Variety Testing

By C. A. Rehbein

Co-operation as stated in the Oxford dictionary means, "working together to the same end". During the past sixty years the Bureau's programme for providing better varieties has been able to function efficiently by obtaining co-operation from growers. Unfortunately this co-operation has had to be repeatedly sought from, and given by, the same small percentage of those growers who are willing to offer a small acreage for variety testing.

Perhaps this is so because the majority of growers do not fully understand the value of their co-operation in bringing a seedling of unknown quantity to the stage at which it can be finally approved and given a "Q" number for commercial planting.

The Seedlings first Years are on The Experiment Station

Each year up to 70,000 new seedlings are raised and planted on the four Experiment Stations throughout Queensland. The initial year consists of their germination from seed in glasshouses in which temperature and humidity are rigidly controlled. Germination can be expected after 48 hours under these conditions. With infinite care and attention the seedlings are raised to a suitable size for transplanting to individual pots within three to six weeks after the planting of the fuzz. They remain and grow on the potting benches for a further six to eight weeks by which time they have stooled and attained a height of twelve inches and are now ready

Fig. 80—Harvesting a trial needs careful supervision by Bureau Officers.

Photo—J. H. Buzacott

for planting into the field on the Experiment Station. Survival of the seedlings after transplanting into the field is assisted by irrigation and, unless hot dry winds prevail within the first week, losses are usually very light. Cultivation and fertilization are carried out as in a normal planting.

In late June, the following year, selections are made from these original seedlings which have grown into a normal mature crop. A standard variety is planted systematically throughout the field with the seedlings so that changes in soil type and fertility can be assessed, and the seedlings are compared with the adjacent standards at selection time. Thirty setts are taken from each selected seedling and planted with commercial varieties in another Station field so that further culling of these selections can be made.

Selection is again carried out on these mature plant 30-sett plots and notes are taken on c.c.s., yield, cover, habit and stooling. The crop is harvested and allowed to ratoon. A second selection on the ratoon cane usually confirms the plant selection but further culling occurs if ratooning is poor or ratoon growth slow. Then there is planted a yield trial consisting of these selected canes and the plant crop of this trial is harvested and each individual plot hand weighed and sampled for c.c.s. The trial is ratooned and, at maturity, once again weighed and sampled. Statistical analysis of these figures determines the canes for further trials.

It will be seen that, when a seedling has reached the stage just mentioned, that seedling has been growing on the Experiment Station for at least four years and has been selected four times. This means that the seedling has been viewed under varying conditions and has performed well compared with the standard variety.

Selected canes are planted out on farms for district trials.

Although the grower can, for obvious reasons, play no part in the first four years of a seedling's life, his cooperation and observations are of immense value from this stage onwards.

Each year, 40 setts of all promising seedlings are taken from the Experiment Station after hot water treatment for the control of ratoon stunting disease, and introduced to two farms in each mill area. They are usually planted by the Bureau's field officers, and the grower requested to treat them as he would his own plant cane. Notes on germination, stooling, vigour and agricultural qualities are made throughout the year. Maturity samples are taken in the next year from the grown crop, and shortly afterwards selection is carried out.

Immediately after this selection at least four other farms are required in each mill area to propagate these seedlings on different soil types, *i.e.*, vigorous canes on poorer lands and the less vigorous on the better soils. tion and for increasing available planting material from which in the following year other growers can obtain supplies. Simultaneously two sites of up to one and a quarter acres are also required for the setting out of varietal trials which determine statistically the value of the new varieties against a known commercial cane. These trials are not possible unless growers co-operate fully, as they will be harvested each year for three years to evaluate the canes in plant, first ratoon and second ratoon.

Each plot has to be hand

weighed and, as cutting gangs are not always agreeable to interference from an outside source, the grower acts as a buffer so that co-ordination can be obtained. During the growth of these propagation plots and trials the grower can also observe the progress of the varieties and form an opinion which can be discussed with, and will be appreciated by, the field officers. Incidentally, the grower alsc obtains some idea of which variety will perform best on his farm.

If a variety has been selected each year and has produced well in the varietal trial then, after the harvest of the first ratoon of these trials, the variety will have been on farms for three years, whilst a further year will be required to build up stocks for distribution; so that, in all, nine years will have elapsed since the planting of the seed.

In the future an increased number of new varieties will be going out on to farms and the number of sites required will also increase. The land required for these sites need not amount to any large acreage providing it is of even fertility, is reasonably accessible and, most important of all, that the grower is willing to co-operate. *In this latter respect don't wait to be asked, get in touch with your local field officer.*

Frost Damage to Q.71

The newest addition to the Approved Variety lists for the Moreton and Maryborough mills, Q.71, is a cane noted for its exceptional early maturing qualities.

In the years before Q.71 attained the status of a commercial cane the variety (then known as seedling L.77) was widely propagated over a range of soil types, and under varying conditions of the Maryborough and Moreton districts. Such propagations were fortunate enough to encounter little severe frost attack, and information on the resistance, or otherwise, of the variety to frosting was not obtained. The cane, by virtue of a somewhat small top, and habit of shedding the majority of its trash, certainly suggested that it would be vulnerable. On the other hand, the high, early sugar content would make the variety a harvestable proposition if damage were occasioned.

During July and August of 1960 several severe frosts were experienced in the Moreton district. However, due perhaps to high soil moisture, little damage to cane occurred. Conversely Maryborough, suffering drier conditions, had a large amount of cane affected by the frosts.

Included in areas attacked were plantings of Q.71. Particular instances were crops on low lying land of the Iindah and Granville Plantations. In these cases where other varieties showed severe destruction of the foliage, the top of Q.71 remained virtually unmarked.

The Q.71 in question was not harvested for some few weeks and no outward change in appearance of the cane was noted. On milling, however, sugar values which in maturity tests early in the season had bettered 15 per cent., went as low as nine c.c.s. Examination of stalks showed death of the growing point and destruction of tissues extending downwards. The topmost nodes were all badly affected. Had the variety shown outward symptoms it could of course have been harvested at a much higher c.c.s. before deterioration became too widespread.

Growers contemplating future use of the variety, which is possessed of many excellent qualities, are urged to avoid frost prone situations where practicable. If the cane is planted under such conditions, regular inspections should be made following frost attack, and the variety harvested as soon as possible.

C.L.T.

Q.67 in the Burdekin District

By J. WESDORP

When Q.67 was first approved for planting in 1959 it had behind it a history of nine years in small test plots. In addition, from May 1955 onwards, the new variety was tested especially under conditions which would normally induce lodging. This was because Q.67 was about the only variety to remain erect after a ten inch downpour was recorded in this district at that time.

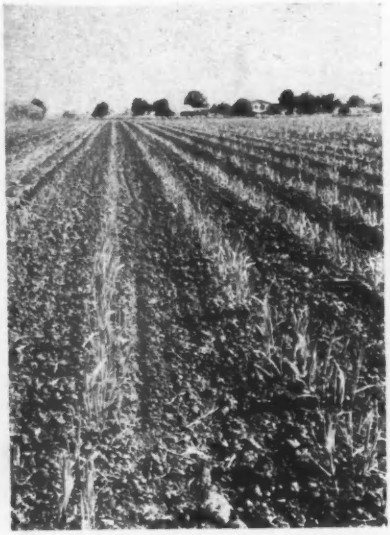

Fig. 81—Healthy ratoons of Q.67 about one month old. Compare this with the poor growth of the ratoon stunting disease affected ratoons in Fig. 82.

Photo—J. Wesdorp

Adverse conditions during subsequent years submitted the variety to further tests. Such conditions were encountered in 1956 during a cyclone, in 1958 during a major flood, and again in 1959 during a severe cyclone. Under all these circumstances Q.67 proved to be a very good anti-lodging variety and appeared to be especially worthwhile on the better than average Burdekin soils, along the Burdekin River banks and on land liable to flooding. Under the same conditions of fertility the standard variety Trojan often lodged and proved excessively costly to harvest, while c.c.s. tests were invariably lower than those of Q.67. However, it was also shown that on the average soils of the district Q.67 would not outyield the standard varieties. Its chief value was as an anti-lodging variety or as a relatively early maturing alternative to wind susceptible Pindar.

Fig. 82—Poor ratoons of Q.67 coming away from stools affected by ratoon stunting disease.

Photo—J. Wesdorp

However valuable the new variety Q.67 was found to be in these special cases it soon became evident that it also possessed a number of inherent faults which must be fully taken into consideration when making decisions of farm policy, i.e., when deciding what

varieties to plant and where to plant them.

Although one of the major weaknesses of Q.67 appeared to be a failure to ratoon satisfactorily officers of this Bureau have shown on numerous occasions that wherever poor ratooning is in evidence, the symptoms of ratoon stunting disease are also readily found.

ratoon stunting disease than other district varieties. Growers who value the possibilities of Q.67 as a variety would do well to keep this in mind by purchasing clean planting material at frequent intervals and by maintaining a strict farm hygiene.

Fig. 83 shows differences which occurred in a block of young plant

Fig. 83—Q.67—A direct comparison between diseased and disease-free planting material. Clean cane on left and r.s.d. affected cane on right.

Photo—J. Wesdorp

Conversely where good ratoons are showing there are no disease symptoms to be found. The two illustrations, Figures 81 and 82, give an idea of what the differences are likely to be :— Fig. 81 illustrates ratoons about one month old and coming away from a healthy crop, while Fig. 82 gives a closer view of a diseased crop when approximately two months old. All available evidence points to the possibility that Q.67 is more susceptible to

cane, cane on the left being healthy, on the right being diseased cane. The healthy cane was planted from clean cane purchased from the Experiment Station and the diseased cane was from the farm's own source. In reality the results are much more striking than can be pictured in this photograph.

Secondly, it was found that Q.67 was liable to top rot under the conditions which favour the outbreak of this disease. Sufficient is known, however,

on top rot to make this risk a relatively minor one if proper precautions are taken. These precautions are to plant the variety early and to maintain growth during spring and summer. In quite a few cases during the growing period of 1959-1960 it was found that even when red stripe, which is the preliminary stage of top rot, was present early in the crop, it was possible to outgrow the effect by adequate irrigation. Thus, in the case of Q.67, irrigation should not be withheld to restrict the growth of cane in spring and summer, but no harm could be done by withholding water in autumn. Ratoon cane is more liable to top rot than plant cane and here the procedure should be to ratoon not too late in the season and again to keep the cane actively growing.

Also it should be kept in mind that Q.67 shows less distress symptoms such as leaf curling and yellowing under dry conditions than other varieties do. It is possible therefore that a farmer unknowingly aggravates the red stripe-top rot problem on his farm because Q.67 fails to show drought symptoms readily, and cane is regularly watered too late. The answer to this is to be guided by soil moisture in determining the irrigation needs since the plant itself is not a good indicator.

Finally it is necessary to sound a warning against too great an area under Q.67 on any one farm. There is clearly a tendency by some farmers who have found Q.67 useful for certain blocks to extend the planting of this variety to land for which it is not really suitable. This is not good policy with any variety and plantings should always be governed by the conditions prevailing in any particular location. If such a programme is carefully adopted there is little doubt that, with the proper precautions, satisfactory results can be obtained with Q.67. As an example of this latter it may be pointed out that the plant cane shown in Fig. 81 yielded about 70 tons per acre with a c.c.s. of 16.

Striate Mosaic

A series of experiments which have been going on at the Bureau's Pathology Farm for several years culminated in proof during the summer that a condition causing poor yields in Pindar and Q.57 on the Burdekin was definitely a new disease of sugar cane. Transmission of the disease was obtained by the Sein inoculation method, i.e., a needle-pricking through a diseased leaf into the leaves of a growing spindle, and it would appear that two viruses are involved. One produces the severe stunting, the other the characteristic fine striations on the younger leaves. The name "striate mosaic" is proposed for the disease and a short Technical Communication is in course of preparation. The disease is transmitted per medium of the sett but since it spreads very slowly in the field, its control should present no problem. The disease has been looked for in other districts but with negative results.—C. G. Hughes.

Some Factors Influencing Efficient Use of Weedicides

By G. C. BIESKE

In this age of increasing numbers of scientific aids to better farming, there is a tendency on the part of some farmers to use these aids believing that miraculous results will always be achieved. When such does not occur it is easy to blame the material itself as being inefficient. When poor results are obtained from the use of chemical weedicides, the reason is sometimes due to the application of the wrong type of weedicide or that insufficient material has been applied per acre. Frequently, however, it has been found that environmental conditions were unfavourable for a satisfactory kill of the weeds concerned.

Provided that the correct type and quantity of weedicide has been applied, the effectiveness of a foliar contact spray is governed by spray retention on the leaves, penetration into the leaves, and movement of the weedicide within the plant. The latter factor, together with the availability of the weedicide in the soil and its entry into the roots are the important considerations in the case of a soil application for pre-emergence or soil sterilisation purposes.

Contact Sprays Applied to the Leaf

The spray retained on the leaves determines actual dose applied. The proportion of spray droplets which bounce off leaves is related to the surface tension of the spray, droplet size, the angle at which droplets hit the leaves, and the velocity of the droplets. The age of the weed and the climatic conditions under which it is growing also influence spray retention. Leaves of many weed species may alter with age in their degree of hairiness and by so doing set up a barrier between the spray and the leaf surface. The outermost layer of the leaf is of a waxy water-repellant nature which can vary depending upon age of the plant and environment. Changes in this waxy layer can therefore affect the amount of spray which runs off the leaves.

Rain falling shortly after spraying may wash all or part of the weedicide off the leaves, depending among other things, upon the time interval, rainfall intensity and duration and type of spray used. It appears that rain falling about twelve hours after spraying has negligible effects in reducing the efficiency of the treatment. This time interval may be lessened considerably, depending upon the type of weedicide employed. The amount of spray reaching the leaves is also governed by wind movements. Spraying early or late in the day when the air is calm is desirable when excessive drift and incomplete coverage is anticipated with later operations.

The penetration of the weedicide into the leaf is influenced by various factors, one of the most important being the degree of *turgidity* of the leaves during and following spraying. When a plant is not suffering from shortage of water the leaves are fully expanded and turgid and in such a condition entry of the weedicide is facilitated. Increasing temperatures hasten the movement of a weedicide through the waxy outer covering of a leaf. An increase in thickness of the external leaf layer with age of the plant or due to climatic changes also has some effect in reducing the ease of penetration.

Weedicides Applied to the Soil

The effectiveness of a weedicide applied to the soil depends upon the ability of the active ingredient to reach the germinating seed or the root systems of established weeds. Usually this comes about either by leaching with water or vapour movement. This can explain why poor results are often noted by farmers using chemicals such as TCA or dalapon in dry weather when soils are very dry. The roots do not come in contact with the soil zone occupied by the weedicide and consequently established plants and shoots from germinating seeds may grow with-

out any damage occurring. Also spraying such chemicals when old established grass stools or a thick mass of weeds are present is an inefficient method of control. Old plants are more resistant to the weedicide and also above-ground vegetation can intercept a large proportion of the spray and prevent it from reaching the soil surface where most of the weedicide action takes place. Under such circumstances it is best to mow or brush the area to be sprayed before making the application. In the case of pre-emergence treatments it is usually essential to have a weed free soil prior to spraying.

Weedicides do not persist indefinitely in the soil. They gradually disappear as a result of leaching, volatilisation, chemical breakdown and microbial decomposition, the latter factor appearing to be the major reason for their disappearance.

Even though a weedicide may eventually be absorbed into the leaves or roots, translocation or movement within the plant is normally necessary before the plant is killed. It has been found that 2,4-D does not move out of leaves which are low in carbohydrates. Since the manufacture of carbohydrates in leaves is governed partly by the amount of sunlight it would be expected that plants growing in full sunlight would be killed faster than when growing in the shade. This has been verified by field observations. The addition of sugar, a carbohydrate, to the spraying solution assists in speeding up the effects of a weedicide under such circumstances. As a rule, movement of a weedicide within a plant is reasonably rapid when a plant is growing vigorously, but when any factor such as lack of moisture is retarding growth, there is a corresponding reduction in translocation of the weedicide.

In general, weeds are most susceptible when growing rapidly under conditions of good soil moisture, satisfactory light, high humidity and sufficient plant nutrients. When growing conditions are adverse, the decreased ability of a weedicide to be suitably located and to penetrate and move within a plant reduces the effectiveness of the given treatment.

Unauthorized Transfers of Fodder Cane

Our attention has been drawn to the advertisements which appear from time to time in various sections of the press concerning the sale of planting material of fodder canes, which are often used by dairy farmers as supplementary feed for their stock during dry periods. These advertisements can prove sources of trouble for the uninformed.

There are various regulations governing the sale and transfer of fodder cane and sugar cane from one quarantine district to another and these have been designed to prevent the spread of certain cane diseases to parts of Queensland where they do not already exist. Any transfer of fodder cane or sugar cane from one quarantine district to another must first be authorized and the necessary permit is then issued, but under no circumstances will the transfer of planting material be permitted from south Queensland to central and north Queensland. Any persons offending against these regulations are liable to fines not exceeding one hundred pounds.

While these regulations have been framed mainly in the interest of canegrowers to help keep their crops free from disease, they also re-act to the benefit of the dairyfarmer who will be able to grow better fodder by dint of having healthy cane in the first instance.

There is no desire to interfere in the legitimate transfer of fodder cane from one farm to another, but dairymen who are contemplating such a course would be well advised to consult beforehand their local Adviser of the Queensland Department of Agriculture and Stock or an officer of the Sugar Bureau.—R.W.M.

FREE SERVICES TO CANE GROWERS

The Bureau offers the following free services to *all* cane growers in Queensland:—

Soil Analysis and Fertilizer Recommendations

Your soil will be analysed by the most modern methods, and a report will be posted containing a recommendation covering the type of fertilizer required, the amount per acre, the need for lime, and other relevant information. Phone the nearest Bureau office and the soil samples will be taken as soon as possible.

Culture for Green Manure Seed

Cultures and instructions for the inoculation of the seed of cowpeas, velvet beans or mung beans will be posted to any cane grower upon request to The Director, Bureau of Sugar Experiment Stations, Brisbane. Allow a week after receipt of your letter for the culture to be prepared and posted, but as the culture will easily keep a month or so it is a good idea to get your culture when you get your seed. If sowing is delayed, ask for another batch of culture; there is no charge.

Advice on All Phases of Cane Growing

The Bureau staff is at the service of all cane growers. They can best advise you on matters pertaining to varieties, fertilizers, diseases, pests, drainage and cultural methods. Bureau officers are available in every major cane growing district. A phone call will ensure a visit to your farm.

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